USER MANUAL

NTW-VD1602
Network Routing Switcher Series

DIGITAL VIDEO ROUTER - 16x2

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0. Revision history

Current revision of this document is the uppermost in the table below.

Revision	Replaces	Date	Change Description
0	-	10/10/00	Initial Revision

1. General

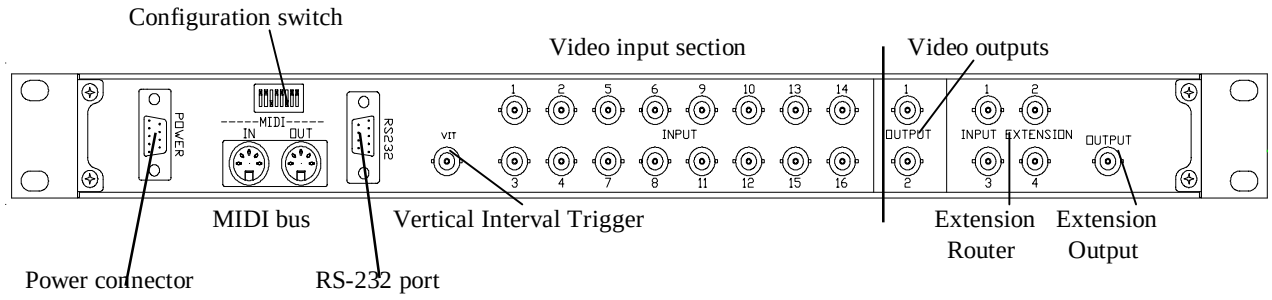
The NTW-VD1602 is a 16x2 serial digital video router with vertical interval switching and integrated control panel. This state of the art router provides maximum quality with a data rate of up to 360Mbit/s and automatic cable equalizing. The NTW-VD1602 offers the possibility to expand the router in the input direction up to 64x2. The NTW-VD1602 is well suited for all demanding routing tasks in digital studio and broadcast environments. The built-in RS-232 interface allows the user to control the router via the i-Control PC software with many operational features. The control bus allows linking the unit to the NTW-AD1602 or NTW-A1602 audio router thus creating a 16x2 AFV router. One or several remote control panels (NTW-16-ProX-Y, NTW-16-ProS) can control the NTW-VD1602 as well. The control panel provides buttons for selection of inputs and 4 function keys with following functions:

- OUTPUT 1 Assigns input buttons to output 1
- OUTPUT 2 Assigns input buttons to output 2
- AUDIO / VIDEO Enables Audio, Video or AFV
- ENABLE Enables panel

1.1. Specifications

Data rate NRZ:	143Mbit/s - 360Mbit/s
VIT input:	Comp. Video 1Vpp, 300mV sync, 75 ohms
Number of inputs:	16 terminated
Equalization:	Automatic up to 300m (Belden 8281)
Number of outputs:	2
Auxiliary inputs:	4 for router extension
Auxiliary output:	1 for router extension
Impedance:	> 75 ohms
Return-loss in/out:	> 18dB (10MHz – 270MHz)
Signal level:	800mV fixed on 75Ohm load
Rise/fall time:	typ. 750ps
Connector:	BNC
AC power:	External power supply 100 - 260 VAC
DC power:	±5V, connector DB9 male
Dimensions:	483 x 44 x 45 mm (19”, 1RU)

1.2. Connection drawing



2. Power connection

Do not connect mains to the desk top power supply before connecting the power supply to the router.

Connect the DB9 female connector from the desk top power supply to the main unit. Tighten the screws to assure a proper contact. To connect mains to the desk top power supply you need a mains cord with IEC 320 connector. NTW-VD1602 uses the desk top power model **AC-10-84-10-005 (±5V / 10W)**.

If an external power supply is used the NTW-VD1602 router requires ±5V DC with a minimum current of 600mA. The following pin-out is used on the DB9 male power connector:

Pin 1	0V
Pin 2	+5V
Pin 6	-5V

3. Connecting the NTW-VD1602 to your PC

For connection to a PC with Miranda's i-Control control software the RS-232 interface is used. The RS-232 port on all Network devices uses the standard DCE pin-out, see pin-out table under 4.3.
A standard modem cable can be used for connecting the router to the PCs serial port.

3.1. Selection of router address

The router address depends on the system configuration the router is going to work with. See chapter 5 for more information. All routers are delivered with default address 0. A router addressed to 0 can be controlled from the i-Control software with address 0. i-Control offers the control of up to 16 different routers or combinations of routers.

3.2. Pin-out of RS-232 connector

The DB9 female connector for the RS-232 port has the following pin-out:

Pin 2	Tx
Pin 3	Rx
Pin 5	GND

3.3. Maximum cable length

The maximum cable length for a RS-232 connection is per definition 15m. Longer distances can be installed depending on the environmental conditions of the installation site. It is up to the installer / user to secure a proper installation of the RS-232 connection.

4. MIDI connection

Via the MIDI bus system several routers and control panels can be interconnected. The standard MIDI interface is used on all Network MIDI control ports. For interconnection between the devices a standard MIDI cable with 5pin DIN connector on both ends is used. The Network MIDI bus system allows connection of up to 16 routers with different addresses on the same bus. Routers which are defined to work married e. g. 2 routers as Audio follow Video or 3 routers as RGB (YUV) must be set on the same address. Control panels dedicated to work with a specific router must have the same address as the router. Several panels can work together with one specific router. Up to 16 single routers or combinations of routers can be controlled from one I-Control control screen. The MIDI bus system and all RS-232 ports interchange the system status.

4.1. Several routers in one system

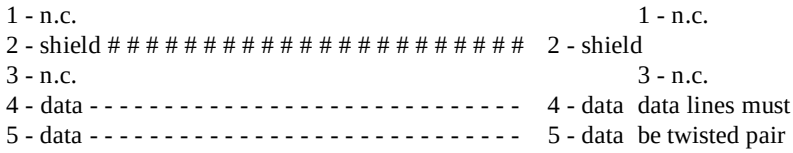
The Network MIDI bus system allows the interconnection of up to 16 routers with different addresses in one system. A combination of routers working married counts as one address. This might for example be 1 audio router + 1 video router working as an audio follow video system or 3 video routers working as a RGB (YUV) system. The routers in such a constellation have to have the same address.

4.2. Connecting control panels

To get a control panel working with a specific router, give the control panel the same address as the router. Several panels can be addressed to the same router. The X-Y panels can control 2 layers with breakaway function. If it is necessary to control more layers with breakaway an additional panel must be used. **Panels can also be connected to a router via the RS-232 interface. Please refer to your control panel manual for installation.**

4.3. Pin-out and cable type

The pin-out of all Network MIDI ports follows the standard MIDI specification.
A 1 to 1 cable with 5pin DIN connector is used. The following pin-out is used:



The standard MIDI specification recommends the use of shielded twisted pair cable types for interconnection between the units.

4.4. MIDI bus structure

The Network MIDI bus structure follows the standard MIDI bus definition. **The Network MIDI bus is defined as a closed chain of units. This means that the MIDI OUT of the last unit must be connected to the MIDI IN of the first unit in the MIDI chain.** To avoid problems with the control of Network units the installer/user has to assure that the bus structure is installed according to this definition. The total number of MIDI devices in a MIDI chain is limited to 50.

4.5. Maximum distance between MIDI devices

The standard MIDI definition allows a maximum cable length of 250 meters between two devices. Longer distances can be made with MIDI repeater units. To avoid grounding problems all Network MIDI ports have opto-coupled inputs.

5. Router configuration

5.1. Router address

Switch 1 - 4 on the configuration switch set the router's address for communication with the i-Control software and other units in the MIDI bus system. The i-Control control screen and the panels on the MIDI bus dedicated to operate with the router have to have the same address. If several routers are combined to form an Audio Follow Video, RGB or similar system, these routers have to have the same address.

The addresses can be switched according to the following pattern:

- \- means switch down
- * means switch up

Default address is 0.

Switch 1	2	3	4	Address
-	-	-	-	0
-	-	-	*	1
-	-	*	-	2
-	-	*	*	3
-	*	-	-	4
-	*	-	*	5
-	*	*	-	6
-	*	*	*	7
*	-	-	-	8
*	-	-	*	9
*	-	*	-	10
*	-	*	*	11
*	*	-	-	12
*	*	-	*	13
*	*	*	-	14
*	*	*	*	15

5.2. Router extension mode

Switch 5, 6 and 7 on the configuration switch set the router's input offset in systems with 2 or more NTW-VD1602. You can build systems up to 64x2. The chosen input offset defines on which input range each NTW-VD1602 works on.

The offset can be switched according to the following pattern:

- \- means switch down
- * means switch up

Switch	5	6	7	Offset
	-	-	-	0
	-	-	*	16
	-	*	-	32
	-	*	*	48

Switch 5 is always in position down.

Default is offset 0.

5.3. Vertical interval trigger

Switch 8 on the configuration switch enables or disables the VIT sensing on VIT input. If VIT switching is enabled but a proper signal is missing, the router will automatically switch without VIT.

The VIT can be switched according to the following pattern:

- \- means switch down
- * means switch up

Switch	8	VIT
	-	disabled
	*	enabled

Default is VIT enabled.

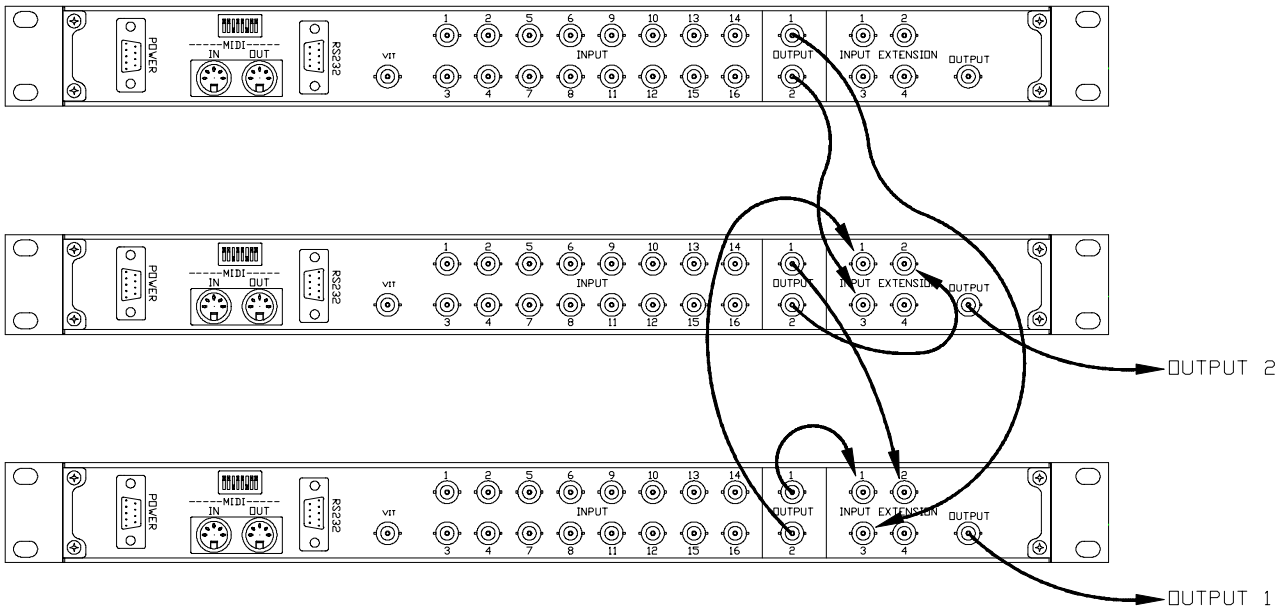
6. Connecting video signals to the NTW-VD1602

The NTW-VD1602 router offers standard 75 ohms BNC connectors for digital video in- and outputs. All digital video inputs are terminated with 75 ohms.

7. Input extension

NTW-VD1602 allows input extension up to 64x2. Please connect the routers as shown below. A 4x1 extension router is used to collect the signal from several units.

Please refer to chapter 5.2 regarding input offset.



8. Control and connection of Network systems, interface protocol

8.1. Important notes regarding the Network Control Protocol

8.1.1. Binary Code

The strings shown on the next pages are in binary coded format. Please be aware of the fact that any terminal program you may use to control a Network unit from a PC must be able to generate hexadecimal characters. ASCII characters will not be accepted.

8.1.2. Acknowledge / Echo

A matrix will reply on a crosspoint set command with an ECHO. In the case where a crosspoint is already set no ECHO will be sent. If the matrix is part of a MIDI system two types of reply will be sent. Immediately after receiving the crosspoint set command the ECHO will be sent. The matrix will then wait for the command to pass the MIDI bus system. After receiving the command from the MIDI bus system the matrix will send the command as an ACKNOWLEDGE.

8.1.3. RS-422 Matrixes

RS-422 Data Routers do not accept distribution of an input signal to several outputs. An input signal can only be routed to one single output. The Firmware of our RS-422 routers takes care of these limitations. If an input (Source) is already connected to a particular output (Destination) any connection of this input to another output will disconnect the previous connection. The router will in this case send the following message for the disconnected output: Output connected to input 128. Input 128 is an internal default for the disconnect status. Please see Network recommendations for use of RS-422 data routers for further information.

8.1.4. Timeout

The Crosspoint Status Request message has a timeout, which means that you need to wait 1 second in between request messages.

8.2. Basic principles

Any message on any level (address) which conforms to the standard arriving at either the MIDI or the RS232 port, will be re-sent on both MIDI and RS232. The only exceptions are:

a) A matrix which recognizes its address will not re-transmit the message if the crosspoint is already set.
b) A matrix which recognizes its address will not re-transmit the message if the output number or input number exceeds its size.
c) A unit (matrix or panel) will not re-transmit a message arriving at the MIDI if it was re-transmitted a short while ago (typically 0.5 sec). This is done by grabbing a message storing it for the timeout period, and comparing it with new messages. After the timeout period the unit will grab a new message for compare. This is done to remove unwanted (read: unknown) messages from the MIDI ring.
d) A message arriving at the RS232 will always be re-transmitted unless it is a matrix, and one of the cases a) or b) is fulfilled.

8.2.1. Example: A single unit with no MIDI connected

Messages sent to the RS232 of a single unit will be returned once no matter what address or input/output number the message has, unless it is a matrix which recognizes one of the conditions a) or b) above.

8.2.2. Example: Several units connected by MIDI

Messages sent to the RS232 of a single unit will be returned once no matter what address or input/output number the message has, unless it is a matrix which recognizes one of the conditions a) or b) above.
If none of the cases a) or b) is fulfilled the message will also be transmitted on the MIDI. Then if any unit on the MIDI ring recognizes any of the cases a)/b) or c), the message will stop at that point. This means that the message will only be returned once on the RS232.
However, if none of the units on the MIDI ring recognizes any of the cases a) to c), the message will return to the originator (the unit which received the message on RS232). This unit will re-transmit the message once more on both MIDI and RS232. The message is therefore returned a second time on RS232. This time one of the cases a) or c) is sure to be identified by one of the units on the MIDI ring, and the message is removed.
There is however one more special case: If several messages for unused addresses are transmitted with only little delay, one might experience that some messages are returned several times, as the store/compare/remove function in case c) can only handle a single message at the time. We therefore recommend that the user avoid sending messages to unused addresses.

8.3. RS232

The RS-232 port is used for external control of Network units. The RS-232 port allows the customer to control the equipment via Miranda's i-Control PC program or self-defined customized solutions.

Connector for the RS-232 port is a DS9 female.
Pin 2 - Tx.
Pin 3 - Rx
Pin 5 - GND

A standard DCE (Data Communication Equipment) cable can be used for connection between PC and Network equipment. The connection between the connectors is made one-to-one.

Data-rate is 9600 baud/sec.
8 data-bit, 1 stop-bit, no parity.

8.4. MIDI

The MIDI bus is used for interconnection between several Network units. Up to 50 routers and/or control panels can be linked together to form a routing system with many operational features.

The MIDI bus utilises a 5 mA current loop with opto coupled ports.
Standard connector is a 5pin DIN.

Standard MIDI cables can be used to interconnect several Network units.

Data-rate is 31.25 kbit/sec.
1 start-bit, 8 data-bit, no parity, 1 stop-bit. Logical 0 = current ON.

8.5. Commands

8.5.1. Audio crosspoint set

Only for use with Audio routers.
Command for setting of crosspoints:

1001nnnn 0kkk kkkk 0vvv vvvv

- nnnn is the matrix address from 0 up to 15.
- kkk kkkk is the output which shall be controlled.
  kkk kkkk = output number
  0 = output 1
  127 = output 128

- vvv vvvv is the input which shall be connected to the chosen output.
  vvv vvvv = input number

8.5.2. Video crosspoint set

Only for use with Video routers.
Command for setting of crosspoints:

1010nnnn 0kkkkkkk 0vvvvvvv

- nnnn is the matrix address from 0 up to 15.
- kkk kkkk is the output which shall be controlled.
  kkk kkkk = output number
  0 = output 1
  127 = output 128

- vvv vvvv is the input which shall be connected to the chosen output.
  vvv vvvv = input number

8.5.3. Crosspoint status request

This command is used for status request on Audio and Video routers.

1100nnnn 0xxxxxxx

- nnnn is the matrix address from 0 up to 15.
- xxxxxxx - do not carry any information

The requested router (Audio or Video) will send its crosspoint status on MIDI OUT and RS232. The same command format as for crosspoint set is used.

General Environmental Requirements for Network Electronics Equipment

1. The equipment will meet the guaranteed performance specification under the following environmental conditions:

- Operating room temperature range 0°C to 45°C
  Except of digital video routers 0°C to 40°C
- Operating relative humidity range up to 90% (non-condensing)

2. The equipment will operate without damage under the following environmental conditions:

- Temperature range -10°C to 55°C
- Relative humidity range up to 95% (non-condensing)

3. Electromagnetic compatibility conditions:

- Emissions EN 55103-1 (Directive 89/336/EEC)
- Immunity EN 55103-2 (Directive 89/336/EEC)
- Electrical safety EN 60 950
  With reference to the declaration of conformity provided with the external power supply.

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Declaration of Conformity with CE

This apparatus meets the requirements of EN 55103-1 (November 1996) with regard to emissions, and EN 55103-2 (November 1996) with regard to immunity; it thereby complies with the Electromagnetic Compatibility Directive 89/336/EEC.

Regarding electrical safety we refer to the declaration of conformity provided with the external power supply.